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Studies on the Rocky Mountain flora—XXIII

PER AXEL RYDBERG

Gaillardia Mearnsii sp. nov.

Annual; stem 1–3 dm. high, leafy only towards the base, finely pubescent; basal leaves oblanceolate or spatulate, petioled, 5–10 cm. long, puberulent, entire or round-lobed; upper leaves similar or sometimes pinnatifid with rounded lobes; peduncles 1–2 dm. high; involucres about 2 cm. broad; bracts lanceolate, acute, grayish-pubescent; disk-corollas purple, their lobes short and rounded, fimbriate; pappus-scales lanceolate, each gradually attenuate into a slender awn equaling the corolla; rays yellow, 10–15 mm. long.

The type sheets were labeled *G. aristata*, which it somewhat resembles in general habit, but the lobes of the disk-corollas are not attenuate. It resembles, however, still more, *G. arizonica* in the annual root, the stem naked above, and the leaf-form, although the leaves are more inclined to be entire; but it differs from that species in the purple disk and the gradually acuminate and long-aristate pappus-scales. On the whole, it is therefore more nearly related to *G. pinnatifida*, although the plant is evidently an annual and the leaves are seldom pinnatifid. When pinnatifid, their lobes are short and rounded.

ARIZONA: Fort Verde, May 4, 1888, *Mearns 322* (type, in herb. N. Y. Bot. Gard.).

UTAH: Sandy bluffs near Green River, June 12, 1900, *Stokes*.

TETRANEURIS

In Coulter & Nelson's New Manual the name *Actinella* Nutt. has been readopted for this genus, apparently in conformity with

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the Vienna Rules. Nuttall, however, did not intend to propose a new genus *Actinella*, but thought that the *Galardia acaulis* of Pursh belonged to *Actinella* Pers., based on *Actinea* Juss. In reality there is no such thing as *Actinella* Nutt. *Actinella* Pers. is a synonym of *Cephalophora*, to which even DeCandolle thought *Galardia acaulis* belonged.

The way Professor Nelson has handled other persons' species of this genus and his own is very arbitrary. *Actinella simplex* A. Nels., *A. incana* A. Nels., and *A. eradicata* A. Nels. he keeps distinct from *A. acaulis* (Pursh) Nutt. Both *Actinella depressa* A. Gray and *Tetraneuris brevifolia* Greene he makes synonyms of his own *Actinella acaulis caespitosa*, and *Tetraneuris glabra* Greene and *T. glabriuscula* Rydb. of his own *Actinella epunctata*. He unites *T. linearis* Greene (Nutt.) and *T. angustifolia* Rydb.; *T. fastigiata* Greene and *T. stenophylla* Rydb.; and lumps under *Actinella leptoclada* A. Gray not only *Tetraneuris mancosensis* A. Nels. and *T. intermedia* Greene but also *T. Crandallii* Rydb., *T. arizonica* Greene, and *T. pilosa* Greene (?).

My studies of the genus have given me quite different results. *Galardia acaulis* Pursh was collected by Bradbury in "Upper Louisiana." Any one who knows a little about Bradbury's travels knows that this meant along the Missouri River, somewhere between St. Louis, Mo., and Fort Mandan, N. D. Further, the type locality must have been in South Dakota or North Dakota, as no species of *Tetraneuris* is known to grow near the Missouri south thereof. The common plant of the plains and hills of the western part of the Dakotas and Nebraska has densely silky, linear-oblanceolate leaves. It is well represented by my own *nos. 106* and *196*, by *MacDougal 53* from Nebraska, and by *Bolley 404* from Mendora, N. D. It is true that the type of *Tetraneuris incana* A. Nels. (*Elias Nelson 5006*) is slightly more delicate and whiter than these, but *A. Nelson 8265*, determined by the author himself as *T. incana* matches perfectly my *no. 106*. *Actinella* or *Tetraneuris incana* A. Nels. is therefore in my opinion the true *T. acaulis* (Pursh) Greene. It is the only one that has been collected in the neighborhood of the type locality. The only other species that has been collected in the Dakotas or Nebraska is *T. simplex* A. Nels. and that only in the very extreme western

portion. The latter does not agree with the description of *Galardia acaulis*.

I have come to the conclusion also that *Tetraneuris eradiata* A. Nels. is but a rayless form of *T. acaulis*. My *no. 106* contains both radiate and rayless specimens. The disk-flowers of *T. eradiata* are said to be "almost orange." They usually turn more or less orange in age in *T. acaulis* and the type of *T. eradiata* is pretty well advanced in age. There are no other distinctive characters either in the description or in the specimens that I can see.

Even *Tetraneuris simplex* is not too good a species and it is very close to *T. acaulis* on one hand and *T. trinervata* Greene on the other. The latter I had reported for Colorado in my Flora of Colorado; but it is wholly ignored by Nelson. As the New Manual includes northern New Mexico, the type locality even of *T. trinervata*, viz., Sandia Mountains, N. M., between Santa Fé and Albuquerque, is within the range.

What Professor Nelson's interpretation of *Actinella acaulis* really is, is hard to tell, for some of the specimens he has distributed under that name and *Tetraneuris acaulis* belong to *T. lanata* and others to *T. acaulis caespitosa* A. Nels. Most of them were distributed before the latter was segregated. Both *E. Nelson 4329*, distributed as *T. acaulis*, and *A. Nelson 4607*, distributed as *T. lanata?*, match perfectly a part of the type of Nuttall's *Actinella lanata* in the Torrey herbarium. All three are very young.

It is evident that *Actinella acaulis caespitosa* A. Nels. is more closely related to *A. lanata* than to *A. acaulis*. It has the loose pubescence of *A. lanata*, a character best seen in age. I am inclined to think that it is the same as *Tetraneuris brevifolia* Greene, although I have not seen the type of the latter. It should then bear that name, unless it is reduced to a variety of *A. lanata*. The plant was first collected by James in Long's Expedition on James Peak (now Pikes Peak), the type locality of *T. brevifolia*. Torrey* referred this specimen to *Actinea integrifolia* Kunth; but in Torrey and Gray's Flora,† it was referred to *Actinella lanata* with the following remark: "The specimen of

*Ann. Lyc. N. Y. **2**: 213.

†**2**: 382.

A. integrifolia? Torr. *loc. cit.* is so imperfect that we can not very confidently refer it to the present species; but it certainly is not the same with the foregoing" [*A. Torreyana*].

When preparing the manuscript of the Flora of Colorado, I overlooked the publication of *Tetraneuris epunctata* A. Nels. Otherwise I should not have proposed *T. glabriuscula* to replace the untenable *T. glabra* Greene. I am perfectly willing to reduce the last two to synonymy. This is, however, not the case with *T. angustifolia*. In the key Professor Nelson has a division, "Crowns of the caudex short" in contrast to "Crowns of the caudex fastigiate and elongated, 1–2 dm. high." Under the first division he includes *Actinella linearis*. If he had given *A. angustifolia* instead it would have been correct. The type of *Actinella scaposa linearis* was collected by Riddell in Texas and is preserved in the Torrey herbarium. It has elongated branches of the caudex as have *Tetraneuris fastigiata* and *T. stenophylla*, and differs from them mainly in the fact that the bases of the leaves are scarcely dilated. I think that *Tetraneuris fastigiata* and *T. stenophylla* also are distinct. This is only a matter of difference in opinion as to limitation of species. If they are to be united, they should be included in *T. linearis*, which is just as closely related. *Tetraneuris angustifolia* on the contrary is more distinct and related to *T. Torreyana*, but lacks the hair-tufts at the bases of the leaves.

Tetraneuris mancosensis A. Nels. is a synonym of *Actinella leptoclada* A. Gray. I am now inclined to regard *T. intermedia* Greene also as such, although I kept it distinct in the Flora of Colorado. But I think it goes too far in "lumping," if one tries to include the acaulescent *Tetraneuris Crandallii*, *T. arizonica*, and *T. pilosa* in the leafy-stemmed *T. leptoclada*. Besides the difference in habit the acaulescent species have abruptly aristate pappus-scales, while in *T. leptoclada* the scales taper gradually into the bristle-point. *Tetraneuris Crandallii* in habit closely resembles *T. Torreyana*, but the scape in not villous and the pappus is different. *T. arizonica*, in which I am inclined to include *T. pilosa*, resembles *T. epunctata*, but the leaves are more hairy, more punctate, and have conspicuous hair-tufts at the bases.

It seems as if enough species have been proposed in this genus,

but still there is a plant of Montana, Idaho, and Saskatchewan, related to *Tetraneuris acaulis*, though differing in so many respects that it would be inconsistent to include it in that species. I therefore propose it as new:

Tetraneuris septentrionalis sp. nov.

An acaulescent perennial, with a short, thick cespitose-pulvinate caudex; leaves spatulate or oblanceolate, mostly rounded at the apex, 1.5–4 cm. long, 5–8 mm. wide, canescent-tomentose, subvelutinous; scape 5–10 dm. high, rather thick, appressed-tomentose; involucres 6–7 mm. high, 12–15 mm. broad, densely villous; bracts elliptic, rounded at the apex; rays 8–10 mm. long, 5–6 mm. wide, very strongly veined; achenes silky-strigose; pappus scales ovate, abruptly short-aristate.

This is related to *Tetraneuris acaulis* and *T. simplex*, but differs from both in the broader leaves, the looser pubescence, the usually shorter and stouter scape, and short bristle-tips of the pappus scales; from the former of these also in the less silky pubescence and the larger and more strongly veined rays, and from the latter in the dense pubescence.

IDAHO: Palouse Country, June–July, 1892, *G. B. Aiton* (type, in herb. N. Y. Bot. Gard.).

MONTANA: Fort Benton, *John Persall 926*; Livingston, June, 1899, *Tweedy*.

SASKATCHEWAN: Cypress Hills, June 23, 1894, *John Macoun 5078*.

WYOMING: Yellowstone Park, June, 1888, *C. H. Hall*.

Hymenoxys Macounii (Cockerell) Rydb. comb. nov.

Hymenoxys Richardsoni, var. *Macounii* Cockerell, Bull. Torrey Club **31**: 474. 1904.

It is not plain whether Professor Cockerell intended this as a variety of *H. Richardsoni* or of his *H. Richardsoni*, subsp. *pumila*. From the discussion, the latter interpretation seems most probable, but technically it seems to have been made a variety of the species. In habit it is most like *H. pumila*, but it has one character that was overlooked by Professor Cockerell, viz., the outer bracts are much thickened on the back, even subcarinate. This would associate the plant with *H. floribunda*

rather than with *H. Richardsoni*. The rays are, however, not so broad or so decidedly cuneate as in that species. The following specimens belong to *H. Macouni*.

SASKATCHEWAN: 1858, *Bourgeau;* Cypress Hills, 1880, *John Macoun*; Medicine Hat, 1894, *John Macoun 5077*; Bare Hills, 1906, *Macoun & Herriot 72840*.

MONTANA: "Northwest Boundary," 1874, *Coues;* Falls of Missouri, 1886, *R. S. Williams 4520;* Midvale, 1903, *Umbach 150;* Manhattan, 1895, *Rydberg 2936*.

Hymenoxys Greenei (Cockerell) Rydb. comb. nov.

Picradenia biennis Greene, Pittonia **3**: 272, in part. 1898. Not *Actinella biennis* A. Gray. 1878.

Hymenoxys Lemmoni Greenei Cockerell, Bull. Torrey Club **31**: 479. 1904.

I think this is specifically distinct from *Hymenoxys Lemmoni*. The best character to distinguish the two was not pointed out by Professor Cockerell or by Dr. Greene. The inner bracts in *Palmer 261*, the type number of *H. Greenei*, of which there are five specimens on two sheets in the Columbia University herbarium, are broadly obovate and more or less erose-dentate on the margins, while in all specimens seen of *H. Lemmoni* they are elliptic and entire. *Watson 616*, from Nevada and referred to the subpecies *Greenei*, belongs to *H. Lemmoni*.

DUGALDEA

Professor Nelson included in this genus *Hymenoxys helenioides* Cockerell (*Picradenia helenioides* Rydb.), on what ground I do not know. Both I, who, with Mr. Vreeland, discovered the plant, studied it in the field, and described it, and Professor Cockerell, who has spent so much time on *Hymenoxys*, believed it a good species of that genus. In *Dugaldia Hoopesii* the bracts are in more than two series, distinct, and in age reflexed; in *Hymenoxys helenioides* they are as in the rest of that genus not reflexed, in strictly two series, and those of the outer series are united at the base.

DYSODIA

Nelson in the New Manual has evidently given *Dysodia* Cav. the same limitation as it has in Engler & Prantl's Pflanzen-

familien, *i. e.*, including *Adenophyllum*, *Hymenatherum*, *Aciphyllaea*, *Thymophylla*, and *Lowellia*. If so, the name *Dysodia papposa* (Vent.) Hitch. and *D. aurea* (A. Gray) A. Nels. can be used; but if these genera are to be regarded as distinct or if they are limited as by Gray and by Hemsley, the names are not the correct ones. The monotype of *Dyssodia* Cav. (originally spelled with two *s*'s), is *D. Porophyllum* = *Adenophyllum* Hemsl., which is not congeneric with either of these species according to Hemsley. The only available generic names for the two species of the Rocky Mountain region would be *Boebera* Willd. and *Lowellia* A. Gray, respectively.

ARTEMISIA

The treatment of *Artemisia* in the New Manual of the Central Rocky Mountains is very unsatisfactory. The author has kept up five of his own species and reduced every species proposed by any one else since 1884 and some before that year, either to synonymy or else to a variety of some older species, except *Artemisia saxicola* Rydb., which was a substitute for the North American so-called *A. norvegica*. Now let us see what the facts really are. There are only two species of Professor Nelson's that I am inclined to uphold, viz., *Artemisia aromatica* and *A. nova*. In such a "conservative" work as the New Manual generally is, even these ought to have been reduced to varieties.

It is questionable if *Artemisia aromatica* A. Nels. can be kept specifically distinct from *A. dracunculoides*. The latter is fully as common in the Rockies as is *A. aromatica*, and even one specimen distributed from the University of Wyoming and named *A. aromatica*, viz., *Goodding 602*, is typical *A. dracunculoides*. Also an older specimen, *Nelson 2469*, belongs here.

Artemisia nova A. Nels. was not altogether new when it was described. In fact, several specimens were found in herbaria before that time under the name *Artemisia arbuscula*. If I am not mistaken, it constituted a part of Nuttall's original *A. arbuscula*, although the description fits better the other part, which therefore may be regarded as the type. Dr. Gray* states: "Two forms, passing into each other (both collected by Nuttall, * * *); one with involucres more campanulate, 7–9-flowered; in the other oblong and only 4–5-flowered." The latter is *A. nova* A. Nels.

*Syn. Fl. 1^2: 374.

The other Nelsonian species have in my opinion no claim to specific rank. Two duplicates of the type of *Artemisia gracilenta* A. Nels., one in the Columbia University herbarium and the other in the New York Botanical Garden collection, are almost identical with the two original specimens of *A. floccosa* Rydb. The only difference is that the segments of the leaves of the former are somewhat narrower. There are also two duplicates of *A. paucicephala* A. Nels., which differs from *A. floccosa* only in the fact that the upper leaves are entire. As Nelson himself unites *A. paucicephala* and *A. gracilenta* and the original *A. floccosa* is intermediate between the two, I see no reason why they should not be reduced to synonyms of *A. floccosa*, which is three years older.

Artemisia subglabra A. Nels., of which there are two duplicates here, is identical with *A. graveolens* Rydberg, three years older. The leaves of even Nelson's own specimens show traces of tomentum on the lower surface. The species is related to *A. discolor*, not to *A. saxicola*, with which Nelson has placed it.

Artemisia natronensis A. Nels. is, according to a duplicate of the type and several specimens distributed from the University of Wyoming, the same as *A. longifolia* Nutt., as that species is understood. The specimens which I referred to *A. natronensis* in my Flora of Colorado do not belong there. They are unusually large-headed *A. diversifolia* or at least closely related to it. I wish to make this correction here.

Now let us take up the species reduced by Professor Nelson. *Artemisia Scouleriana* (Besser) Rydb. and *A. Forwoodii* S. Wats. are reduced to synonyms of *A. canadensis*.

Artemisia canadensis Michx. is a subarctic plant and not found in the Rocky Mountains within the United States. The type came from the shores of the Hudson Bay. It is a low plant with the leaves mostly basal, with narrowly linear divisions, and comparatively few heads nearly as large as those of *A. spithamaea* Pursh (*A. borealis* Auct. Am.) and in a narrow panicle. I have seen specimens from the White Mountains; Vermont; the Gaspé Peninsula, Que.; Keweenaw Point, Mich.; and the Yukon Territory; but from nowhere in our western states. The specimens named *Artemisia canadensis* from there belong to *A. Forwoodii* or *A. Scouleriana*. Whether the latter two should be regarded as

distinct is questionable, but they are evidently different from *A. canadensis*, and Besser, regarding them as such, referred them, first to *A. desertorum* and later to *A. commutata*. In the original publication,* Dr. Watson compares *A. Forwoodii* with *A. discolor*, to which it has no close relationship. It is the same as *A. desertorum Hookeriana* Besser.†

Artemisia kansana Britton and *A. stenoloba* Rydb. are given as synonyms of *A. Wrightii*. The description of the last in the New Manual is mostly copied from Dr. Gray, who perhaps included *A. kansana*, but the type, *Wright 1279*, is not the same as *A. kansana* Britton. The plant Professor Nelson had in mind is evidently *A. kansana* and not the true *A. Wrightii*, judging from the key and from the association with *A. coloradensis* Osterhout. The true *Artemisia Wrightii* has an involucre only slightly tomentose and the leaves glabrate above and is very close to *A. Bakeri* Greene, differing mainly in the erect instead of nodding heads. If *Artemisia Bakeri* should be reduced to a variety of *A. mexicana*, *A. Wrightii* should also. *A. stenoloba* Rydberg was never described, but the specimens so named in manuscript belong to *kansana*. There is however, an older name for this species, viz., *A. Carruthii* Wood, as pointed out by Mr. Mackenzie.

Artemisia rhizomata A. Nels., *A. pudica* Rydb., *A. pabularis* (A. Nels.) Rydb., *A. Purshiana* Besser, and "probably" *A. candicans* and *A. floccosa* Rydb. are reduced to synonyms of *A. gnaphalodes* Nutt. If *A. rhizomata* and *A. pabularis* (originally described as a variety by Nelson) are reduced to synonymy I shall enter no protest. I do not know what the first really is. One specimen in the Columbia herbarium bears the type number, but it does not agree with the original description and the label evidently has been interchanged. Some of the specimens distributed later under that name belong to the form of *A. gnaphalodes* common in the Rocky Mountain region. The form growing in Wisconsin, the type state of *A. gnaphalodes*, looks quite different, although it is almost impossible to characterize the differences in words. *Artemisia pabularis* is a peculiar plant, in some respects intermediate between *A. gnaphalodes* and *A. microcephala* Wooton,

*Proc. Am. Acad. **25**: 133. 1890.

†Hook. Fl. Bor.-Am. **1**: 325. 1833.

but with narrower leaves than either. *A. pudica* Rydb. is related to *A. gnaphalodes* and *A. diversifolia*, but in my opinion distinct. This is, of course, a matter of individual opinion. *A. Purshiana* is a northern plant with much broader leaves and denser inflorescence than the ordinary *A. gnaphalodes*. It is common in British America and Montana, has been collected in the Dakotas, and one specimen from Nevada I have referred doubtfully here, but I have seen no specimens from Wyoming or southward. Perhaps this species is unknown to Professor Nelson.

I must protest, however, against the reduction of *Artemisia candicans* Rydb., and *A. floccosa* Rydb. to synonyms of *A. gnaphalodes*. *Artemisia floccosa*, as stated above, should take the place of *A. paucicephala* and *A. gracilenta*, and the *A. candicans* is related to it. Using Nelson's key, one would place it in *A. paucicephala*, but the heads are still broader, sessile in small clusters, nodding or spreading, instead of erect, and the tomentum is more loose.

Artemisia Underwoodii Rydb., *A. Brittonii* Rydb. and *A. latiloba* (Nutt.) Rydb. are made synonyms of *A. ludoviciana* Nutt. I doubt if Professor Nelson knew what the first two are. One specimen of *A. Underwoodii*, viz., *Goodding 1934*, was distributed from the University of Wyoming under the name *A. silvicola* G.E.O. Both *A. Underwoodii* and *A. silvicola* are perhaps more closely related to *A. mexicana* than to *A. ludoviciana*.

Artemisia Brittonii Rydb. has the leaves permanently tomentose on both sides and would be placed in *A. gnaphalodes* if Nelson's key were used. It is most nearly related to *A. Purshiana*, but has at least the lower leaves deeply lobed.

Artemisia latiloba (Nutt.) Rydb. should be known as *A. Hookeriana* Besser. I have seen a duplicate of the latter in the Gray herbarium and there is no doubt that it is the same as my *A. latiloba*. It is a northern plant, not found in Wyoming and rare in Montana. It has the same leaf-form as *A. elatior* and *A. Suksdorfii*, but the inflorescence is denser and the involucre is densely tomentose. It is sometimes hard to distinguish from, and in the west seem to grade into, what has been known in California and Nevada as *A. heterophylla* Nutt. The latter name is

untenable and belongs evidently to *A. Suksdorfii.* The California-Nevada plant has been described as *A. Kennedyi* A. Nels., but even this must pass into synonymy, for the plant has an older name, *A. Douglasiana* Besser.

Under *Artemisia discolor* is given as a synonym: "*A. elatior* (T. & G.) Rydb. as to our range." *A. discolor* and *A. elatior* can never be confused, but perhaps this could happen with the latter and *A. incompta* Nutt., which Nelson has regarded as a variety of *A. discolor*, following Dr. Gray. Good specimens of *A. elatior*, resembling the type in the Columbia University herbarium, have been collected in Montana and one specimen which I can refer to no other described species we have from Colorado.

Artemisia spiciformis Osterhout is reduced to a synonym of *A. arbuscula* Nutt. It is not related to that species but is related to *A. Rothrockii* A. Gray. The specimens from Utah collected by Ward and Parry and referred to by Dr. Gray,* belong to *A. spiciformis* Osterhout.

Nelson has also reduced several species to varieties, viz., *A. Parryi* A. Gray, *A. coloradensis* Osterhout, *A. diversifolia* Rydb., *A. silvicola* Osterhout, and *A. Bakeri* Greene.

There is scarcely any better species than *A. Parryi* and it can never be justly referred to *A. saxicola.* Not only has the plant "a tendency to become glabrate," but the pubescence, if any is present, is not that of *A. saxicola*, but is short-silky and appressed, the heads are usually much more numerous than in that species and not racemose, and the corollas are perfectly glabrous. If it were not for the absolute lack of tomentum I should place it next to *A. franserioides* and *A. discolor.* It is strange that Professor Nelson reduced this species to a variety, while he regarded *A. Pattersonii* as distinct from *A. scopulorum.* Besides, what rules of nomenclature was he following, when he reduced the older species *A. Parryi* to a variety of the later *A. saxicola?*

Artemisia coloradensis Osterhout is made a variety of *A. Wrightii.* As *A. Wrightii* of Nelson is not the original *A. Wrightii* A. Gray, but *A. kansana* Britton (see above), a new combination is necessitated, if the specific rank of *A. coloradensis* is not upheld.

Artemisia diversifolia Rydb. is made a variety of *A. gnapha-*

*See Syn. Fl. I²: 375.

lodes Nutt. This is of course a matter of individual opinion. It is fully as good as the two Nelsonian species *A. aromatica* and *A. nova*, which I am inclined to admit.

Artemisia silvicola Osterhout and *A. Bakeri* Greene are made varieties of *A. mexicana*. The former is, as stated before, related to *A. mexicana*, but the latter is very hard to distinguish from the original *A. Wrightii*. *A. mexicana* is not found in the Rockies and not even near them. What goes under that name from New Mexico and Arizona is mostly either *A. neo-mexicana* Greene or *A. microcephala* Wooton. The latter extends into southern Utah and Nevada.

So many species have already been proposed in this genus that it may seem a little hazardous and unnecessary to add more to the already too large number. There are, however, two plants, both collected by *Bourgeau* on the Palliser Expedition in Saskatchewan, that can not be included in the species known by me, so that it seems better to give descriptions of them here. The second one was rediscovered in Alberta by Macoun and Herriot.

Artemisia Bourgeauana sp. nov.

Perennial with a tap-root and short caudex; stem silky-pubescent, more or less tinged with red, 3–4 dm. high; basal leaves petioled, 4–6 cm. long, sericeous-canescent on both sides, twice-pinnatifid with oblanceolate divisions; stem-leaves pinnatifid with linear, crowded divisions, rather small; heads numerous in a narrow panicle; involucres nearly 5 mm. wide, silky-villous, yellowish and shining; bracts oval, broadly scarious-margined; flowers light yellow, the central ones sterile.

This species is perhaps most closely related to *Artemisia Forwoodii*, having the same habit and leaf form, but the plant is more silky and the heads are twice as broad, fully as large as in *A. spithamaea* and *A. canadensis*. From the former it differs in the numerous heads, compound inflorescence, yellow instead of brown flowers, and taller stem. From *A. canadensis* it differs in the compact inflorescence, the densely silky leaves, and broader leaf-segments.

SASKATCHEWAN: 1857–9, *Bourgeau* (type, in herb. Columbia University).

Artemisia Herriotii sp. nov.

Perennial with a rootstock; stem 6–10 dm. high or more, tomentose; leaves entire or sparingly and sharply toothed, 5–20 cm. long, 5–15 mm. wide, glabrate and green above, densely white-tomentose beneath, rather thin, margins not revolute; inflorescence a narrow compact panicle with very numerous small heads; branches erect, racemiform; heads erect; involucres about 5 mm. high, 2.5–3 mm. broad; bracts oblong-ovate to ovate, acute or obtuse, yellowish, densely tomentose; flowers yellow, the central ones fertile; receptacle naked.

Bourgeau's specimens were referred to *Artemisia longifolia* by Dr. Gray, but they are not closely related to that species. The leaves are not revolute-margined and the heads are not half the size of those of that species. It is most closely related to *A. silvicola* and *A. Hookeriana* Besser (*A. latiloba* Rydb.). It differs from the former in the denser and narrower inflorescence, the erect heads, the denser tomentum on the involucres, and the firmer leaves, and from the latter in the more entire leaves and the smaller, more cylindric heads.

ALBERTA: Edmonton, Aug. 25, 1906, *Macoun & Herriot 72825* (type, in herb. N. Y. Bot. Gard.).

SASKATCHEWAN: 1858, *Bourgeau* (in herb. Gray).

ACHILLEA

A great diversity of opinion exists among botanists as to the number of species of this genus found in America. Dr. Gray admitted three species, *Achillea Millefolium*, *A. multiflora*, and *A. Ptarmica*. Evidently Nelson held the same view, as he admits only *A. Millefolium*, the other two not being found in the Rocky Mountain region. Piper in his Flora of Washington* admitted *A. lanulosa* Nutt. as variety of *A. Millefolium*. Robinson and Fernald† regarded *A. lanulosa* as a good species. Pollard‡ admitted 10 species as North American. Of these one is Mexican and three escaped or introduced. Afterwards he, in coöperation with Cockerell,§ described an additional species from New Mexico. With the exception of *A. multiflora* and perhaps *A. laxiflora*,

*Contr. U. S. Nat. Herb. vol. 11.

†Gray's New Manual 845.

‡Bull. Torrey Club **26**: 365–375. 1899.

§Proc. Biol. Soc. Wash. **15**: 179. 1902.

which is unknown to me, all the North American species are closely related to *A. Millefolium* and may be only forms of that species. Notwithstanding the fact that *Achillea borealis*, on account of its large heads and numerous rays, has been placed in the *Ptarmica* section of the genus, it is closely related to *A. Millefolium*, and can be connected with it through two different lines of relationship. (See below.) It is very hard to say whether the native species of the *Millefolium* group admitted by Pollard should be regarded as species or as varieties of *A. Millefolium* and my intention here is not to express any opinion on that subject. I only wish to clear certain points regarding which there seems to be a great deal of confusion. I shall here use the specific names that have been applied to the different forms, whenever such are available.

ACHILLEA MILLEFOLIUM L. Sp. Pl. 899. 1753

This is a native of northern Europe and I think also of northern New York and New England and eastern Canada; at least it has naturalized itself in that part of North America. Elsewhere it is only sparingly introduced. It is a characteristic northern plant. It differs from all the other native forms in being less villous and having shorter hairs. The rachis of the leaves is distinctly wing-margined and the primary segments more or less decurrent; they are usually decidedly spreading. The secondary segments are short, lanceolate, and spinulose-tipped. The rays are comparatively large, 2–3.5 mm. broad. The bracts have usually brown margins. In the far north, the plant often becomes more hairy and the margins almost black, and it approaches *A. borealis* on one hand and *A. lanulosa* on the other. Of such specimens we have one from North Iceland, collected by Olasur Davidson, and two collected by Collins and Fernald, one at Carleton Point, Que., in 1904 (labeled *A. lanulosa*) and the other at Mt. Albert, Que., in 1906, *no. 257* (labeled *A. borealis*).

Achillea occidentalis Raf.; DC. Prod. **6**: 24. 1837, as a synonym under

A. Millefolium occidentalis DC. *loc. cit.*

A. Millefolium Pollard, Bull. Torrey Club **26**: 371, in part. 1899. Not *A. Millefolium* L. 1753.

This is evidently the plant that Pollard took for the real

Achillea Millefolium. It is characterized by the small rays, only 1.5–2.5 mm. broad, and straw-colored bracts, pointed out by Pollard. It differs also from *A. Millefolium* in the narrow linear and usually more elongated segments of the leaves. There is also only a trace of a wing-margin on the rachis and the stem is usually more hairy and with longer hairs. DeCandolle regarded it as a variety of *A. Millefolium* and stated that it is intermediate between that species and *A. setacea*, a native of Southern Europe. In my opinion it is nearer to *A. setacea*, having the small rays and narrow segments of that species, but is more hairy. It is the common native form of the prairie region from Wisconsin to Kentucky, Arkansas, and eastern Nebraska, but specimens have been collected as far east as Pennsylvania and South Carolina. Three specimens from southern Colorado I have also referred here.

ACHILLEA LANULOSA Nutt. Journ. Acad. Nat. Sci. Philadelphia **7**: 36. 1834

A. tomentosa Pursh, Fl. Am. Sept. 561. 1814. Not *A. tomentosa* L. 1753.

This resembles the foregoing in many respects; the pubescence (although often more copious) and the color of the bracts are the same. The segments of the leaves are much shorter and more crowded and more directed forward; the rachis has not even a trace of a wing margin and the rays are much larger, 2.5–4 mm. (Pollard gives them up to 6 mm.) broad. This is the common plant of the Rocky Mountain region and its range extends from Saskatchewan to Kansas, New Mexico, northern Mexico, the mountains of California, and British Columbia.

ACHILLEA SUBALPINA Greene, Leaflets **1**: 145. 1905

A. lanulosa alpicola Rydb. Mem. N. Y. Bot. Gard. **1**: 426. 1900.
A. alpicola Rydb. Bull. Torrey Club **33**: 157. 1906.

This resembles a depauperate *Achillea lanulosa* in habit, but the margins of the bracts are strongly colored, usually almost black, though sometimes only brown, and such specimens approach closely *A. lanulosa*. The inner bracts as are a rule decidedly acute and in this respect it resembles *A. borealis*. It differs, however, from that species in the small heads, not over 4

mm. broad, the less numerous rays, and the short and crowded leaf-segments. It belongs to the higher Rocky Mountains.

ACHILLEA BOREALIS Bong. Veget. Sitcha 149. 1832

In many respects this is close to the typical *Achillea Millefolium*. The heads are usually larger and have more rays; the bracts are usually darker but not always so. The main differences are in the inner bracts, which are decidedly acute, the narrow and usually long segments of the leaves, the rachis, which is almost without a wing margin, and the longer pubescence. The leaves resemble much those of *A. occidentalis* and *A. californica*. The range of *A. borealis* extends from the Mackenzie to Alberta, British Columbia, and Alaska. The plant of Newfoundland and Labrador, which has been referred to this species is somewhat different. So far as I know, it has not received any specific name, but it has been described under the following name:

ACHILLEA MILLEFOLIUM NIGRESCENS E. Meyer, Pl. Labrad. 65. 1830

It has the large heads and dark-margined bracts of *A. borealis*, but the bracts are not acute, the leaf-segments are broad and short, and the rachis has a decided wing-margin. It agrees therefore in every respect with *A. Millefolium*, except the larger head and the more numerous flowers.

ACHILLEA CALIFORNICA Pollard, Bull. Torrey Club **26**: 369. 1899

This, so far as I know, is not found in the Rocky Mountain region. It is restricted to the Pacific Coast. It is usually taller and more robust than any of the species mentioned above. The character of the head is practically the same as in *A. Millefolium*, but the heads are larger, about as large as in *A. borealis*. The margins of the bracts are usually not so dark as in that species and none of the bracts are acute. The leaf-form is more that of *A. borealis* and *A. occidentalis*, but the segments are usually still more elongated and more divaricate. The leaves are usually thrice rather than twice pinnatifid.

ACHILLEA ARENICOLA Heller, Muhlenbergia **1**: 61. 1904

This resembles in many respects the preceding but is much more copiously villous than any of the other species. The inflorescence is compact and of many large heads. The leaf-segments are short and crowded as in *A. lanulosa*, but the plant is stouter, the heads much larger and the margins darker. It has been mistaken for *A. borealis*, but has neither the blackish margins nor the acute inner bracts of that species.

ACHILLEA GIGANTEA Pollard, Bull. Torrey Club **26**: 370. 1899, and

ACHILLEA LAXIFLORA Pollard & Cockerell, Proc. Biol. Soc. Wash. 15: 179. 1902, are both unknown to me.

The species or forms discussed above are fairly distinct when typical specimens from the centers of their distribution are compared. It must be admitted that intermediate forms are not altogether lacking. Intermediate forms between *Achillea Millefolium* and *A. Millefolium nigrescens* have been collected in Newfoundland. In northern New England *A. Millefolium* seems to be the only species. In New York, New Jersey, and Pennsylvania, both this and *A. occidentalis* are found, but intermediate forms seem to be very rare. In the center of distribution of *A. occidentalis*, viz., in Wisconsin, Illinois, Iowa, and Kentucky, *A. Millefolium* seems to be unknown, while in the north it has been collected in Manitoba, Saskatchewan, Alberta, and even British Columbia. It has been found also in Colorado; but judging from the localities, these specimens might have been escapes from cultivation. I have seen yarrows planted around miners' cabins. From Colorado and Nebraska I have seen a few specimens that were somewhat intermediate between *Achillea occidentalis* and *A. lanulosa*, but in almost every case they could be referred either to one or the other. *A. lanulosa* and *A. subalpina* both belong to the Rockies, but they grow at different altitudes; the former grows also on hillsides of the Great Plain region and at an altitude of 1000–3500 m.; the latter only in the high mountains at an altitude of 3000–4000 m. Hence at an altitude of 3000–3500 m., they are both found. Here intermediate forms might be expected. In California both *Achillea lanulosa* and *A. californica* are found, but

I have seen no intermediate forms. There are several specimens from Utah, Idaho, and Washington which I refer to *A. lanulosa*, though they approach *A. californica* in the stoutness of the plant and the larger heads. From Washington I have seen a specimen intermediate between *Achillea californica* and *A. borealis* and another between *A. arenicola* and *A. borealis*. *Achillea borealis* is not found in the Rockies within the United States and *A. subalpina* not in British America outside of the Rockies. The only specimen which I refer to *A. borealis* though approaching *A. subalpina*, is from the Canadian Rockies of Alberta.

Petasites corymbosa (R. Br.) Rydb. comb. nov.

Tussilago corymbosa R. Br. in Chloris Melv. 21. 1823.

Petasites palmata frigida Macoun, Cat. Canad. Pl. 1: 553. 1886. Not *P. frigida* (L.) Fries. 1845.

This has been included in *Petasites frigida* (L.) Fries, but differs in the deeply lobed leaves, the lobing extending one third to one half the distance to the midrib. It is the more common plant of the Canadian Rockies, known as *P. frigida*.

ARNICA

This genus, as represented in western North America is one of the most perplexing, and the last word concerning it is far from being said. I doubt if all the species proposed by Dr. Greene and Professor A. Nelson can be maintained. One of my own, *Arnica monocephala*, must be regarded as a low broad-leaved form of *A. pedunculata*, and *A. tenuis* Rydb. might be an entire-leaved and monocephalous form of *A. Rydbergii* Greene. On the other hand there are evidently forms of this genus that have not been described.

Considerable confusion has existed in regard to *Arnica Chamissonis* Lessing and *A. mollis* Hook. Gray in his Synoptical Flora united the two. In the old Torrey herbarium there are two specimens. One of these bears the printed label "*Arnica Chamissonis* Lessing, Unalaschka" and was received from St. Petersburg. It is evidently from the original collection. It is a plant of the *A. foliosa* group, with longer loose villous pubescence. We have several specimens similar to it from British Columbia, Alberta, and Saskatchewan and at least one from Mon-

tana. The other specimen is a duplicate of the type of *A. mollis*, received from Hooker. This is almost identical with *A. subplumosa* Greene, or *A. Chamissonis longinodosa* A. Nels., except that the involucral bracts are broader, oblanceolate, and abruptly short-acuminate. It represents a plant not uncommon in the Rockies, from northern Wyoming northward. The *Arnica* that is not uncommon in New England was referred to *A. Chamissonis* in Gray's Manual, 6th edition, and to *A. mollis* by Robinson & Fernald in the Gray's New Manual. It has nothing to do with the former. It is related to the latter, but is, I think, distinct enough. It has more affinity to *A. amplexifolia* Rydb. (*A. amplexicaulis* Nutt.) and *A. rivularis* Greene than to *A. mollis* Hook. It does not have the broad bracts of *A. mollis*. It should be known as *Arnica lanceolata* Nutt. A duplicate of the type (if not the actual type) of the last named is found in the Torrey herbarium.

What Professor Nelson had in mind as *Arnica mollis* when preparing the manuscript of the New Manual, I can not imagine. In his key he separates it from *Arnica subplumosa* by the "leaf blades decurrent on the petioles." The blades are slightly and but slightly decurrent in both. His description is very vague and evidently drawn from several species. As synonyms he cites "*A. Chamissonis* in part, but mostly *A. latifolia* as to our range (*A. latifolia* A. Gray, Bot. Calif. **1**: 415. 1885; *A. tomentulosa* Rydb. *loc. cit.* **28**: 20. 1901)." It is true that Gray and others referred *A. mollis* to *A. Chamissonis*, but I do not know that it has been referred to *A. latifolia*, unless by Prof. Nelson. *Arnica latifolia* A. Gray in the Botany of California comprises *A. latifolia* Bong., *A. Menziesii* Hook. (this perhaps not specifically distinct from *A. latifolia*) and *A. diversifolia* Greene (*A. latifolia viscidula* A. Gray). None of them has anything to do with *A. mollis*. *A. tomentulosa* Rydb. is related to *A. Chamissonis* Less., but differs in the short pubescence and the broad involucral bracts, rounded at the apex. If the form of the bracts should happen to be a variable character and of no specific value, Nelson's own *Arnica rhizomata* should be reduced to a synonym of *A. tomentulosa*, as there are practically no important differences except the form of the bracts and the latter name is nearly five months older.

Greene's idea of *Arnica Chamissonis* is also wrong. He states

under *A. columbiana*: "It can not be referred to *A. Chamissonis*, since it lacks the distinctly obovate leaf-cut, the broad, short disk-corollas and the tawny subplumose pappus of that species." These characters belong to *A. mollis*, not to *A. Chamissonis*.

There are more exceptions to be made to the treatment in the New Manual. Under *Arnica ventorum* Greene are given as synonyms *A. platyphylla* A. Nels. and *A. grandiflora* Greene. I have not seen the type of *A. platyphylla*, but *A. grandiflora* Greene is closely related to *A. cordifolia* Hook., and is not of the *A. latifolia* group. One specimen collected by R. S. Williams and referred to *A. platyphylla* by Nelson in his original publication is exactly like a specimen sent to Dr. Torrey as *A. Menziesii* by Dr. Hooker and included by him in his Flora. Both of these are very close to the original *Arnica latifolia* Bong., of which there is a duplicate in the Torrey herbarium. The only essential difference is that *A. latifolia* has perfectly glabrous achenes, while in *A. Menziesii* and Williams' plant the achenes have a few scattered hairs toward the upper end and are sparingly glandular-granuliferous.

Arnica sylvatica Greene is made a variety of *A. subplumosa*, and specimens distributed from the University of Wyoming under the name *Arnica subplumosa sylvatica* are nothing but a low-stemmed *A. subplumosa*. But the original *A. sylvatica*, of which there are two duplicates in the herbarium of the New York Botanical Garden, is quite different. It has cordate basal leaves and coarsely and saliently toothed stem-leaves. It is related to *A. diversifolia* Greene (*A. latifolia viscidula* A. Gray).

Professor Nelson has also united *Arnica fulgens* Pursh and *A. pedunculata* Rydb. What the original *A. fulgens* was, I do not really know, as I have not seen Bradbury's specimen; but *A. fulgens*, as interpreted by myself and by Piper,* has a horizontal slender rootstock, without any tufts of brown hairs, while *A. pedunculata*, including *A. monocephala* Rydb., is characterized by its short, thick, almost erect rootstock, with dark brown hair-tufts in the manner of *Plantago eriopoda*. It is the only species in North America that has this character, so far as I know.

*Contr. U. S. Nat. Herb. **11**: 590 and 592.

Arnica caudata Rydb. sp. nov.

Perennial, with a short cespitose rootstock; stems 2–3 dm. high, leafy, villous, and densely glandular-puberulent; leaves nearly erect, linear-lanceolate, mostly sheathing at the base, densely glandular-puberulent and with scattered villous hairs, 5–10 cm. long, 5–8 mm. broad, caudate-attenuate at the apex, with entire, somewhat revolute margins; heads mostly 3, cymose, with the lateral peduncles usually exceeding the terminal one; involucres turbinate, about 1 cm. high, glandular-puberulent and hirsute; bracts linear-lanceolate, almost subulate, attenuate; ligules nearly 1 cm. long, 1–1.5 mm. broad, deeply toothed or cleft; achenes slender, cylindric, glandular-granuliferous, and sparingly hispidulous; pappus short, sordid, plumose; corollas more or less pubescent.

This species is perhaps related to *Arnica longifolia* but is easily distinguished by the low habit, the caudate-attenuate leaves, and the hirsute as well as glandular-puberulent bracts.

UTAH: Big Cottonwood Cañon, near Lake Catherine, Aug. 3, 1905, alt. 9300 ft., *A. O. Garrett 1547* (type, in herb. N. Y. Bot. Gard.).

SENECIO

The original *Senecio Bigelovii* was collected by Bigelow on the Whipple Expedition and a specimen is in the herbarium of Columbia University. It differs from all that have been known under that name in later years by the lower leaves having long petioles and ovate-lanceolate blades. The petioles are longer than the blades, and the latter are abruptly contracted below. In *S. chloranthus* Greene and *S. contristatus* Greene the basal leaves have comparatively short petioles, and the blades taper gradually below. These two species, which it may be, should be united in one, are therefore fully as distinct from *S. Bigelovii* as is *S. scopulinus* Greene. The latter is acknowledged as a variety in Coulter & Nelson's New Manual under the name *S. Bigelovii Hallii* A. Gray. It is in reality much closer to *S. chloranthus* than either is to *S. Bigelovii*. Dr. Greene* in proposing *S. scopulinus* says: "True *Bigelovii* is still unknown except from southern New Mexico, and is of very different aspect, with thin and not at all succulent deep-green herbage, usually no trace of any pubescence,

*Pittonia 4: 117–118.

but consisting of short stiff straight hairs whenever present. This, the real *S. Bigelovii*, was distributed by Mr. Wooton, from the White Mountains of New Mexico, as *S. Rusbyi*, an error for which I am solely responsible. The species is nearer to *S. Rusbyi* than it is to *S. scopulinus*, which latter I have until recently assumed to be the typical *S. Bigelovii*." These statements of Greene are correct in as far as that the specimens distributed by Wooton and referred to by Greene are the most like the original *S. Bigelovii* of any that we have in the herbarium of the New York Botanical Garden, but Wooton's specimens have narrow leaves, the blades of the basal ones are not abruptly contracted at the bases, and the heads are smaller than in *S. scopulinus*, while those of the type of *S. Bigelovii* are much larger, even larger than those of *S. contristatus*.

The treatment of *Senecio* in the New Manual of the Botany of the Central Rocky Mountains is fairly good. There are many cases, however, in which the authors have reduced species to synonymy under closely related species, where the writer is inclined to keep them distinct, but where this is merely a matter of difference of opinion. But there are other cases in which such reductions are wholly unwarranted, misleading, and destructive to real science. Such a case for instance, is where *Senecio solitarius* Rydb. is made a synonym of *S. subnudus* DC. A mere reading of the description of the former would show that it is related to the group comprising *S. integrifolius* Nutt., *S. columbianus* Greene, *S. perplexus* A. Nels. etc., while *S. subnudus* is related to *S. aureus*. Another case is where *Senecio Flintii* Rydb. is made a synonym of *S. glaucescens* Rydb. The former is closely related to *S. exaltatus* Nutt. and has a short crown with fascicled roots, characteristic of the *S. integrifolius* group, while *S. glaucescens* has a distinct rootstock, and is related to *S. anacletus* Greene.

Under *Senecio perplexus* A. Nels. we find the following statement: "(*S. columbianus* Rydb. in Fl. Col., not *S. columbianus* Greene, of which *S. atriapiculatus* Rydb. is a synonym.)" The true typical *Senecio columbianus* Greene is found in Colorado and not uncommon. The only question in my mind is whether *S. perplexus* A. Nels. is really specifically distinct. The only

difference is the more distinct toothing of the leaves of the former and the tendency of the upper stem-leaves to be narrower and more distinctly auriculate-clasping. *S. columbianus* and *S. perplexus* are really more closely related to each other than *S. dispar* A. Nels. is to *S. perplexus*, of which Professor Nelson has made it a variety.

Both *Senecio Harbourii* Rydb. and *S. Howellii* Greene have been made synonyms of *S. canus*. Before I published the former I visited the Gray Herbarium and had a conference with Dr. Greenman. I found that two of the species I had in manuscript he also intended to publish, viz., *S. Harbourii* Rydb. and *S. multicapitatus* Greenm. I published the latter under Greenman's name, and retained my own for the former. *S. multicapitatus* Greenm., Professor Nelson reduces to a synonym of *S. Riddellii* T. & G. I know that at least a few years ago, Dr. Greenman, our best student of *Senecio*, regarded both *S. Harbourii* and *S. multicapitatus* as good species. In Piper's Flora of Washington,* *S. Howellii* is kept distinct from *S. canus*. The manuscript of the genus was prepared by the aid of Dr. Greenman.

Senecio salicinus Rydb., *S. canovirens* Rydb., and *S. lanatifolius* Osterhout are given as synonyms of *S. Fendleri*. *S. salicinus* is more closely related to *S. rosulatus* Rydb. than to *S. Fendleri*. The other two are somewhat related to *S. Fendleri* but I think perfectly distinct, having an altogether different foliage. *S. lanatifolius* has besides discoid heads.

Regarding *Senecio rosulatus* Rydb., I may say that when that species was proposed we had but one sheet of *S. Nelsonii* and that not a duplicate of the type. This sheet bears two undeveloped plants, one of them evidently belonging to the variety *uintahensis*. My conception of *S. Nelsonii* was therefore rather *S. uintahensis* A. Nels. I am willing therefore to accept *S. rosulatus* as a synonym.

Senecio uintahensis A. Nels. is related to *S. multilobatus* T. & G., as Nelson indicates; but the latter is not a winter annual or biennial, but a perennial with a tap-root, just as *S. uintahensis* is.† The main differences are that *S. multilobatus* is more glabrous,

*Contr. U. S. Nat. Herb. **11**: 599.

†See Bull. Torrey Club **27**: 170 and 172.

has narrower divisions to the stem-leaves, and has hispidulous instead of glabrous achenes.

Under *Senecio cymbalarioides* Nutt., in the New Manual is given the following: "(*S. Jonesii*, S. *subcuneatus*, *S. acutidens* Rydb. * * * and *S. oodes* Rydb. * * * seem to be impossible to discriminate satisfactorily)." *S. subcuneatus* and *S. acutidens*, especially the latter, are closely related to *S. cymbalarioides*, but the others are not. *S. Jonesii* is more closely related to *S. uintahensis* than to *S. cymbalarioides* and is perhaps not specifically distinct. If not, *S. Jonesii* is the older name and should be used.

Senecio Hartianus Heller is given as a synonym of *S. pseudaureus* Rydb. Professor Nelson may have been led astray by myself, for the specimens referred to *S. Hartianus* in my Flora of Colorado are but depauperate specimens of *S. pseudaureus*. The true *S. Hartianus* is closely related to *S. flavulus* Greene.

Senecio pyrrochrous Greene and *S. Tracyi* Rydb. are made synonyms of *S. longipetiolatus* Rydb. They are both more related to *S. pseudaureus*, having cordate or reniform, although entire, basal leaves, while in *S. longipetiolatus* the basal leaves are narrow and oblanceolate, tapering into the petioles.

Senecio fediifolius Rydb. and *S. nephrophyllus* Rydb. are made synonyms of *S. discoideus* (Hook.) Britton, perhaps because all three have usually discoid heads. The original descriptions show that they are entirely different plants. *S. discoideus* should be replaced by *S. pauciflorus* Pursh, which is an older name. Greenman and Blankinship* think that *S. nephrophyllus* is the same as *S. debilis* Nutt. I have not seen the type of the latter and can not express any opinion.

Dr. Greenman some years ago called my attention to the fact that the plant usually known as *Senecio eremophilus* Richardson, does not agree with the original. There is a duplicate of the latter in the Columbia University herbarium and it differs from the Colorado plant in the larger heads, which are 10–12 mm. high and about 1 cm. wide and ascending or spreading instead of erect. In the Colorado plant the heads are less than 1 cm. high. *S. eremophilus* is a northern plant, its range extending from Manitoba to

*See Supplement to the Flora of Montana 102.

North Dakota, Montana, and northward far down the Mackenzie. Dr. Greenman thought that the Colorado plant should be referred to *S. MacDougalii* Heller, and so I adopted that view in the Flora of Colorado. I have seen two specimens from Colorado which may be included in *S. MacDougalii*, but the rest belong to what I think should be recognized as a distinct species.

Senecio ambrosioides sp. nov.

Senecio eremophilus Porter & Coulter, Syn. Fl. Colo. 82, mainly. 1874. Not *S. eremophilus* Richards.

Senecio MacDougalii Rydb. Fl. Colo. 397. 1906. Not *S. MacDougalii* Heller. 1899.

Perennial, with a stout rootstock; stem glabrous, leafy, 4–10 dm. high; leaves lanceolate or oblanceolate in outline, pinnatifid to near the midrib or the lower incised, glabrous, all except the uppermost short-petioled, the lobes lanceolate, coarsely dentate or incised; heads numerous, corymbose-paniculate, 9–10 mm. high, erect; involucres glabrous, 6 mm. high and about as broad; bracts carinate, linear, acute, with black tips, the calyculate ones subulate, 4–5 mm. long; ligules light yellow, 5–6 mm. long, 1.5–2 mm. wide; achenes minutely scabrous-puberulent on the angles.

This species differs from *Senecio MacDougalii* in the larger heads (in *S. MacDougalii* only about 7 mm. high), more campanulate involucres, lanceolate instead of linear divisions of the leaves, and the achenes scabrous-puberulent on the angles. From *S. eremophilus* it differs in the smaller and erect heads (in *S. eremophilus* 10–12 mm. high), shorter rays, and smaller leaves. *S. ambrosioides* grows in damp places at an altitude of 1800–3000 m.

COLORADO: Green Mountain Falls, El Paso County, Aug. 2, 1892, *C. S. Sheldon* (type, in herb. N. Y. Bot. Gard.); above Beaver Creek, July 8, 1896, *Crandall 3030;* Pagosa Peak, 1899, *Baker 706;* Parrott City, 1898, *Baker, Earle & Tracy 475;* Ute Pass, 1896, *Clements 190;* Colorado Springs, July, 1893, *Saunders;* Parlin, Aug. 16, 1901, *B. H. Smith 127;* Ruston Park, 1901, *Clements 152;* Mesa Yempa, 1898, *Shear 3943;* Chambers Lake, 1896, *Baker;* Ute Pass, 1896, *Shear 3695;* mountains between Sunshine and Ward, 1902, *Tweedy 4863;* Empire, 1903, *Tweedy 5783;* Silver Plume, 1895, *Shear 4999;* La Veta, 1896, *Clements 166;* Silver Plume, *1894, E. A. Bessey;* Georgetown, 1878, *M. E. Jones 728;* Gunnison, 1901, *Baker 596.*

WYOMING: Bridger Peak, 1903, *Goodding 1942;* between Sheridan and Buffalo, 1900, *Tweedy 3034;* Upper Buffalo Fork, 1899, *C. C. Curtis;* Centennial Mountain, Albany Co., 1902, *Aven Nelson 8773;* also 1900, *7719;* Copperton, 1901, *Tweedy 4136;* Eastern slope of Big Horn Mountains, 1900, *Tweedy 3033.*

NEW MEXICO: Mineral Creek, 1904, *Metcalfe 1415;* Santa Fé Cañon, 1897, *Heller 3819.*

Senecio Kingii sp. nov.

Senecio eremophilus D. C. Eat., Bot. King's Exp. 191. 1871. Not *S. eremophilus* Richards. 1823.

Perennial, with a thick rootstock; stems glabrous, 3–6 dm. high, rather stout, leafy; leaves obovate or oblanceolate in outline, 4–7 cm. long, the lower petioled, all pinnately lobed one third to one half the distance to the midrib, with ovate or lanceolate, more or less toothed lobes; heads numerous, corymbose-paniculate, 9–11 mm. high; involucres glabrous, campanulate, 7–8 mm. high, 6–7 mm. broad; bracts linear, acute, carinate, sometimes with small black tips; the calyculate ones few, subulate; rays 5–7 mm. long; achenes scabrous-papillose on the rounded angles.

This species is related to *S. eremophilus*, but differs in the somewhat smaller and erect heads, less deeply dissected leaves, and their broad and short divisions, and shorter rays. One of the specimens cited below was determined some years ago as *S. glaucifolius*, but that species differs from this as well as from the rest of the group in the narrower and scarcely carinate bracts.

UTAH: Cottonwood Cañon, Aug. 1869, *S. Watson 676* (type, in herb. Columbia University); Alta, Wahsatch Mountains, 1879, *M. E. Jones 1144;* American Fork Cañon, July 1895, *M. E. Jones;* Big Cottonwood Cañon, Aug. 1905, *Garrett 1591;* near Marysvale, 1905, *Rydberg & Carlton 7068;* Mount Barrette, *7206;* Fish Lake, *7506.*

Senecio Leonardi sp. nov.

Perennial, with a short rootstock; stem 4–5 dm. high, loosely floccose; basal leaves long-petioled; petioles 5–15 cm. long; blades obovate or oval, 2–6 cm. long, densely crenate, rather thick, loosely floccose, or in age glabrate, rounded at the apex; lower stem-leaves similar but with shorter petioles, the middle ones more or less lyrate-pinnatifid at the base; upper stem-leaves 1–3 cm. long, lanceolate in outline, pinnately lobed and somewhat

auriculate-clasping; heads in a rather dense corymb, 8–9 mm. high; involucres somewhat turbinate and floccose at the base, 5–6 mm. high, 6–7 mm. broad; bracts linear, acute, carinate, brownish-black on the backs, yellowish brown on the margins; rays orange, about 6 mm. long, 2 mm. wide; achenes glabrous.

This species resembles most the eastern *Senecio tomentosus* in habit and pubescence, but differs in the shorter blades of the basal leaves, which are obovate or oval instead of ovate, in the dark involucres, and the glabrous achenes. It grows in meadows at an altitude of 1500–2000 m.

UTAH: Near divide, head of American Fork Cañon, July 29, 1885, *Leonard 143* (type, in herb. N. Y. Bot. Gard.); Wahsatch County, near Midway, July 6, 1905, *Carlton & Garrett 6701*.

Senecio Tweedyi sp. nov.

Senecio flavovirens Rydb. Bull. Torrey Club **27**: 181, in part. 1900.

Senecio Balsamitae A. Nels., Coult. & Nels. New Man. Cent. Rocky Mts. 583, in part. 1909.

Perennial, with a rootstock; stem glabrous, or slightly floccose at the leaf-axils, 4–6 dm. high, striate; basal leaves 3–15 cm. long, petioled; blades elliptic or oval to oblanceolate, crenate-dentate, often lyrate-pinnatifid with a few lobes below the large terminal one; lower stem-leaves similar, but more pinnatifid; upper stem-leaves deeply pinnatifid, with oblong toothed divisions; heads corymbose, 9–10 mm. high; involucres glabrous, somewhat turbinate at the base, about 8 mm. high and as broad; rays narrow, bright yellow, 8–10 mm. long and a little over 1 mm. wide; achenes hispidulous on the margins.

This species has been mistaken for *Senecio flavulus* Greene (*S. flavovirens* Rydb.). In fact, the type was included in the original publication of *S. flavovirens* and the characters of the achenes were drawn from it. The type of *S. flavovirens* is just in bloom and the achenes only slightly developed, but a closer investigation shows that they are perfectly glabrous. So are the young achenes of all the specimens cited under *S. flavovirens* except *Tweedy 586*. As this had well-developed achenes, I unfortunately described the achenes from it. The type of *S. flavovirens* and the other specimens cited under it, with the single exception mentioned, belong to *S. flavulus* Greene, described a few months earlier. Be-

sides the difference in the achenes, *Tweedy 586* has longer and narrower rays and more deeply dissected stem-leaves than has *S. flavulus*. Since the publication of *S. flavovirens* we have received more specimens with long and narrow rays, but otherwise resembling closely *S. flavulus*. All these specimens have also hispidulous achenes.

WYOMING: Buffalo Fork, Aug. 1897, *Tweedy 586* (type, in herb. N. Y. Bot. Gard.); Snake River, Aug. 12, 1899, *Aven Nelson & Elias Nelson 6402*; headwaters of Clear Creek and Crazy Woman River, 1900, *Tweedy 3031;* low ground, Adams Ranch, Jackson's Hole, July 15, 1901, *Merrill & Wilcox, 967*.

MONTANA: Lima, June 30, 1895, *Shear 3409*.

The following species described from within the range of the New Manual or known to exist therein are not accounted for at all in that publication: *S. seridophyllus* Greene, *S. lanceolatus* T. &. G., *S. pereziifolius* Rydb., *S. neomexicanus* A. Gray, *S. laramiensis* A. Nels., *S. Hallii* Britton, *S. exaltatus* Nutt., *S. Scribneri* Rydb., *S. Porteri* Greene, *S. alpicola* Rydb., *S. turbinatus* Rydb., *S. pentadontus* Greene, *S. cognatus* Greene, and *S. Wardii* Greene.

Greene and Greenman regard *Senecio altus* Rydb. as a synonym of *S. sphaerocephalus* Greene, and I think that *S. perennans* A. Nels. is but a broad-leaved form of *S. werneriaefolius* A. Gray.

Blankinship in his Supplement to the Flora of Montana adopts *Senecio saxosus* Klatt, giving under it the synonyms: *S. petraeus* Klatt, *S. petrocallis* Greene, and *S. alpicola* Rydb. I can not find that *S. saxosus* Klatt was ever published. *S. petraeus* Klatt, or *S. petrocallis* Greene, is not found in Montana and *S. alpicola* is well distinct, being more closely related to *S. werneriaefolius* than to *S. petrocallis*.

TETRADYMIA

In the New Manual, *Tetradymia multicaulis* A. Nels. and *T. linearis* Rydb. are given as synonyms of *T. inermis* Nutt. The first I regard as a low depauperate form of *T. inermis*, but the second can not well be reduced to a synonym thereof. It is somewhat intermediate between *Tetradymia canescens* and *T. glabrata*. Except in the early spring it bears fasciculate leaves, as does *T.*

glabrata, but these leaves are more tomentose. The primary leaves are neither erect nor subulate and somewhat spine-like as they are in *T. glabrata*. It differs from *T. canescens* in the narrower, more or less falcate primary leaves and the presence of secondary fasciculate ones.

Tetradymia longispina (M. E. Jones) Rydb. comb. nov.
Tetradymia spinosa longispina M. E. Jones, Proc. Calif. Acad. Sci. II. **5**: 698. 1895.

This I think deserves specific rank.

NEW YORK BOTANICAL GARDEN.

Cienfuegosia Drummondii, a rare Texas plant

FREDERICK L. LEWTON

Several years ago, while collecting in western Texas, the writer's attention was attracted by a note in Coulter's Botany of Western Texas in reference to a malvaceous plant, *Fugosia Drummondii* Gray. "Found in Gonzales County many years ago by Drummond, but, so far as known, not since found."

Being engaged in field experiments with cotton for the United States Department of Agriculture, the rarity of this close relative of the cotton plant aroused a desire to discover it again, and during the past four years the plant has been kept in mind and sought for pretty generally throughout southwestern Texas.

Consultation of the United States National Herbarium revealed the fact that the single North American specimen of this plant there preserved was obtained by that indefatigable collector of western plants, A. A. Heller, at Corpus Christi, Texas, in 1894. Of this find he says:

"In rich black land on the edge of a water hole near the Arroyo, Corpus Christi, altitude 40 feet. Very few plants were seen, and only one in flower, but the others in good fruit. Flowers almost two inches in diameter, greenish yellow. Apparently a very rare plant."*

With this clue the writer carefully investigated the locality mentioned in July, 1909, but found no traces of the plant.

A species of *Sida* having leaves closely resembling those of the plant sought was eagerly gathered many times in the belief that the quest was ended, but a closer examination showed that it belonged to the opposite end of the mallow family from that of *Fugosia*.

On June 15, 1910, the four-year search was rewarded by finding several plants of this rare species in flourishing condition in a

*Contr. Herb. Franklin & Marshall College, no. 1: 67. 1895.

cotton field belonging to the Coleman-Fulton Pasture Company at Taft, Texas. This is a rapidly developing town in San Patricio County, located on the San Antonio & Aransas Pass Railway between Sinton, the county seat, and Gregory, the junction with the Rockport branch of the railroad. The first plant found was all but buried in the soil, the field having been cultivated a few days before.

This plant was subsequently found to be plentiful at Taft, in the fields, where it can escape the agricultural implements, around the margins of the irrigating tanks, and along the banks of the roadside ditches. Its large sulphur-yellow flowers tinged with green make it a conspicuous object when in bloom.

According to Small* and Heller† this plant is the same as the Brazilian plant described by Saint-Hilaire‡ under the name *Fugosia sulfurea*. Another student of this difficult genus, Hochreutiner, considers the Texan plant a variety of the Brazilian species and in an annotated list of the species of the genus§ labels it *Cienfuegosia sulphurea*, var. *Drummondii*.

The Brazilian species is evidently quite variable, however, and Gürke has described‖ under the name of *Cienfuegosia sulphurea*, var. *glabra*, a variety which appears to be nearer Gray's *Fugosia Drummondii* than the typical *F. sulfurea*. Morong's *no. 929*, collected in Paraguay in February 1891, when compared with the Texas specimen, shows a larger, more erect plant; leaves more nearly round; curved and much shorter peduncles, having fewer, smaller and narrower involucral bracts and bearing smaller flowers, which have a "brown eye at the base inside." ¶

In the opinion of the writer the Texas plant differs from the Brazilian *Cienfuegosia sulfurea* (St. Hil.) Garcke by sufficient characters to warrant the restoration of Gray's specific name. These differences might be contrasted as follows:

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*Small, J. K. Flora Southeastern United States 777. 1903.

†Heller, A. A. Contr. Herb. Franklin & Marshall Coll. no. 1: 67. 1895.

‡Saint-Hilaire, A. Flora Brasiliae Meridionalis **1**: 252. *pl. 49*. 1825.

§Hochreutiner, B. P. G. Ann. Conserv. et Jard. Bot. Genève **6**: 57. 1902.

‖Gürke, M. Martius, Flora Brasiliensis **12**[3]: 577. 1892.

¶Morong, T. Ann. N. Y. Acad. Sci. **7**: 60. 1892.

C. sulfurea	*C. Drummondii*
Plant pubescent.	Plant glabrous but for a few scattered stellate hairs on younger parts.
Stipules ovate.	Stipules linear-subulate.
Leaves subrotund, subcordate, less than 1 inch long.	Leaves oblong or obovate, 2 inches long.
Peduncles but little longer than the petioles.	Peduncles twice as long as the petioles or more.
Bracts of involucre 5–6, linear, 6–8 mm. long.	Bracts of involucre 8–10, spatulate, 10–20 mm. long.
Flowers with brown or purple center.	Flowers without dark center, greenish yellow throughout.
Style exserted beyond the staminal tube more than the length of the stamens.	Style but little exserted beyond the stamineal tube.
Capsules 3–4-celled, covered with black tuberculate glands.	Capsules 5- or rarely 4-celled; black glands not conspicuous.
Cells 1-seeded by abortion.	Cells 3–5-seeded.

The name for the Texas plant should thus be **Cienfuegosia Drummondii** (A. Gray) Lewton, comb. nov.

The synonymy is as follows:

Fugosia Drummondii A. Gray, Pl. Wright. 1: 23. 1852.

Hibiscus Drummondii Kuntze, Rev. Gen. Pl. 1: 67. 1892.

(?) *Cienfuegosia sulphurea*, var. *glabra* Gürke; Mart. Fl. Bras. 12^3: 577. 1892.

Cienfuegosia sulphurea, var. *Drummondii* Hochreutiner, Ann. Conserv. et Jard. Bot. Genève 7: 57. 1902.

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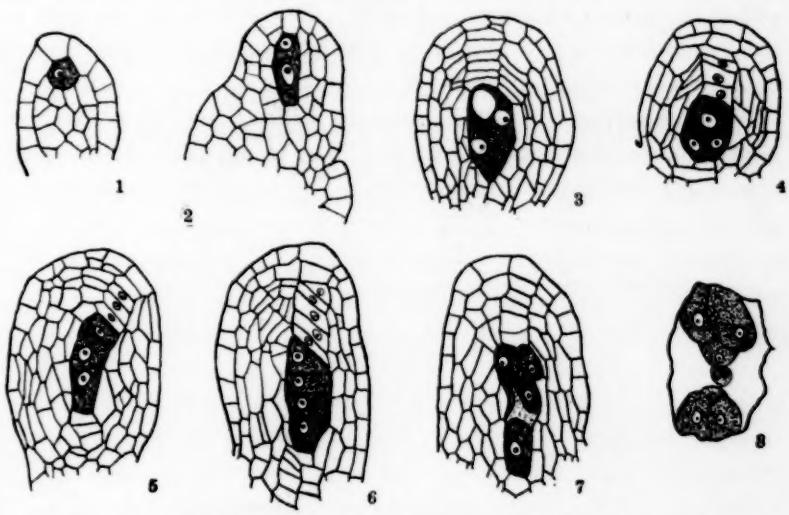
Development of the embryo-sac of Hybanthus concolor

FRANK M. ANDREWS

The embryo-sac of *Hybanthus concolor* (Forst.) Spreng. (*Cubelium concolor* Raf.) begins its development as an hypodermal cell. At first this cell is not different apparently from the other cells about it, but soon it becomes very grumous and is then easily distinguishable (FIG. 1).

The mother-cell of the embryo-sac next divides by a transverse wall into two cells unequal in size (FIG. 2). The terminal one of these two cells becomes somewhat more granular than the others and gives rise to the primary tapetal cell. By the rapid and nu-



FIGURES 1–8. Development of the embryo-sac of *Hybanthus concolor*. The figures are magnified 420 diameters. See text for explanations.

merous transverse divisions of this primary tapetal cell the embryo-sac when completely formed and sometimes even before maturity is covered by many layers of cells. Vertical as well as transverse divisions of the cells of the tapetal region also occur, so that frequently several quite regular rows of cells above the embryo-sac are produced (FIGS. 3, 4, 5, 6). Sometimes this regularity of these

divisions in the tapetal region is not shown. Instances were noticed where before and also after the formation of the primary tapetal cell the mother-cell of the embryo-sac divided longitudinally. These, however, in every instance divided into cells like those usually surrounding the embryo-sac mother-cell but were more granular.

The embryo-sac mother-cell divided first into two and then into four cells in the usual way. These divisions were often very irregular, as in some cases (FIG. 3) they were nearly vertical, and as shown by FIG. 4 were completely vertical after the first division.

The formation of the embryo-sac by the dissolution of these four cells generally begins with the lowest one of the tetrad and proceeds apically as regards the ovule through the other three. This is not always the case, for some instances were noticed in this same plant where the dissolution began with the next to the lowest cell of the tetrad as shown in FIG. 7. The embryo-sac, formed by the destruction of the tetrad as well as some of the surrounding cells, is very large.

The egg apparatus and antipodal cells in this plant are unusually large, as shown by FIG. 8. They frequently extend nearly across the embryo-sac lengthwise. The secondary nucleus was usually rather small.

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Other editions of Emory's Report, 1848

Oliver A. Farwell

In the Bulletin of the Torrey Botanical Club for September, 1895, Dr. Barnhart points out some differences in detail between the botanical portions of Executive Document No. 7, for the Senate, and Executive Document No. 41, for the House, the same being Lieut. W. H. Emory's Notes on a Military Reconnoissance. In the same journal, for the following March, Mr. F. V. Coville, in discussing the above paper, deduces from internal evidence that Ex. Doc. No. 41 was published earlier in 1848 than Ex. Doc. No. 7. Mr. Coville also mentions a third edition, by H. Long and Brother, of New York, which is an exact copy of Ex. Document No. 7 but paged differently.

It may be of interest to botanists to know that other editions have been published. In the library of Parke, Davis & Co., Detroit, Mich., there is a copy of each of both House and Senate documents which are different in some respects from those described by Dr. Barnhart and Mr. Coville. Judging from the remarks of Messrs. Barnhart and Coville on the subject of typographical errors in the earlier editions, I should imagine, from a careful perusal of these copies, that many of the earlier errors were corrected in these editions.

Executive Document No. 41 was published in 1848, according to the date of the title page. The character (7) appears on pages 17–32, inclusive, of Lieut. Emory's "Notes" instead of on pages 145–158 of the botanical portion as described by Dr. Barnhart. The full description of *Zinnia grandiflora* Nutt. is included and appears on page 144. In other respects it agrees with the edition described by Messrs. Barnhart and Coville.

The other copy is appendix No. 2, taken bodily from some report, but gives no evidence to indicate the report of which it formed a part or its date of publication. The page is somewhat smaller than that of Ex. Doc. No. 41 and the lines are double-spaced, but the body of the report is essentially the same; the

pagination is from 179 to 211, the figures appearing in the middle at the top of each page, and therefore is probably a second issue of edition 3 described by Mr. Coville and is Doc. No. 7; it differs from this however, in that the plates are those of C. B. Graham of Washington, D. C., and plate VI is labeled *Baileya multiflora* instead of *B. multiradiata*. It includes *Convolvulus Nuttallii* and *Alternanthera?* (*Endotheca*) *lanuginosa*, which are not in Doc. No. 41. *Cereus gigantens* of the latter becomes *C. giganteus* in the former; *E.* [*Eriogonum*] *Aberteanum* n. sp. becomes *E. Abertianum* n. sp.; and *Stillengia spinulosa* n. sp. becomes *Stillingia spinulosa* n. sp. Also the concluding part of Dr. Engelmann's Report, matter pertaining to No. 15 and *Cereus giganteus*, is entirely rewritten. Prof. Torrey's report occupies pages 179–206; p. 207 is occupied by an explanation of plates; and on pages 208–211 appears Dr. Engelmann's report.

It would, therefore, appear that there are five editions of Lieut. Emory's Report, all of which probably were published in 1848: two of Ex. Doc. No. 41, one without a description of *Zinnia grandiflora* and one with it; three of Ex. Doc. No. 7, one with pagination the same as that of No. 41 and two with different pagination; of the latter, one has the plates of E. Weber & Co. and one has the plates of C. B. Graham; and all three differ from the second edition of No. 41 in including *Convolvulus Nuttallii* and *Alternanthera lanuginosa*.

DETROIT, MICHIGAN.

INDEX TO AMERICAN BOTANICAL LITERATURE

(1910)

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in its broadest sense.

Reviews, and papers which relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

This Index is reprinted monthly on cards, and furnished in this form to subscribers, at the rate of one cent for each card. Selections of cards are not permitted; each subscriber must take all cards published during the term of his subscription. Correspondence relating to the card-issue should be addressed to the Treasurer of the Torrey Botanical Club.

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Barnhart, J. H. *Koeberliniaceae.* N. Am. Flora **25**: 101, 102. 3 Je 1910.

Bean, W. J. *Cornus florida* var. *rubra.* Curt. Bot. Mag. IV. **6**: *pl. 8315.* My 1910.

Berger, A. *Agave Franzosini.* Curt. Bot. Mag. IV. **6**: *pl. 8317.* Je 1910.

Berry, E. W. Additions to the Pleistocene flora of Alabama. Am. Jour. Sci. IV. **29**: 387–398. *f.* 1–3. My 1910.

Berry, E. W. Contributions to the Mesozoic flora of the Atlantic coastal plain.—V. Bull. Torrey Club **37**: 181–200. *pl. 19–24.* 29 Ap 1910.

Birger, S. Om förekomsten i Sverige af *Elodea canadensis* L. C. Rich. och *Matricaria discoidea* DC. Arkiv Bot. **9**[7]: 1–32. *pl. 1–3* + *f. 1, 2.* 18 Ja 1910.

Blakeslee, A. F. The botanic garden as a field museum of agriculture. Science II. **31**: 685–688. 6 My 1910.

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U. uniporulus and *U. valens*, spp. nov.

Kindberg, N. C. New contributions to Canadian bryology. Ottawa Nat. **23**: 180–191. 27 Ja 1910.

Includes new species in *Grimmia* (4), *Barbula* (2), *Meesea*, *Mielichhoferia*, *Philonotis*, *Physcomitrium*, *Mnium*, *Bryum* (10), *Brachythecium* (2), and *Hypnum*.

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